North American Ustilagineae

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NORTH AMERICAN USTILAGINEAE.

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CONTRIBUTION FROM THE CRYPTOGAMIC LABORATORY OF HARVARD UNIVERSITY. 53.

The following paper is a result of studies made upon this group of fungi by the writer during the past two years in the Cryptogamic Laboratory of Harvard University. It is preliminary to a monograph of the Ustilagineae of North America that he hopes to issue in the near future, the work on this having been largely completed. In the present paper there is given a list of the species with their hosts and distribution so far as is now known. Synonyms have also been given in those cases where needed to show the identity of the species. The writer's studies have shown that a number of forms, described chiefly from this country, do not deserve distinct specific recognition and in such cases these are also given as synonyms under the proper species. The generic position of a number of species has been changed and such changes are indicated at the proper place. A few new species are also described here for the first time. In this paper proper specific names are not capitalized in order to conform to the usage of this Journal though this does not represent the writer's ideas on the subject.

The writer is responsible for the following synonyms (printed in italics): *Cintractia patagonica* Cke. & Mass. (synonym of Ustilago bromivora); *Doassansia affinis* Ell. & Dearn. (Doassansia intermedia); *Entyloma castaliae* Holw. (Entyloma nymphaeae); *Entyloma holwayi* Syd. (Entyloma polysporum); *Schizonella subtrifida* Ell. & Ev. (Thecaphora trailii); *Sorosporium atrum* Pk. (Thecaphora aterrima); *Sorosporium bigeloviae* Griff. (Thecaphora pilulaeformis); *Sorosporium cenchri* Henn. (Sorosporium syntherismae); *Sorosporium williamsii* Griff. (Ustilago hypodytes); *Thecaphora astragali* (Pk.) Wor. and *Thecaphora desmodii* (Pk.) Wor. (Thecaphora deformans); *Tilletia serpens* Karst. and *Tilletia aculeata* Ule. (Ustilago macrospora); *Tilletia externa* Griff. (Cintractia externa); *Tilletia mixta* Mass. p. p. (Ustilago mulfordiana); *Tilletia rotundata* (Arth.) Ell. & Ev., *Ustilago maclagani* Berk. (Tilletia maclagani); *Tolyposporium davidsonii* Diet. & Holw., *Poikilosporium davidsonii* Diet., (Thecaphora piluaeformis); *Urocystis gei* Ell. & Ev. (Urocystis waldsteiniae); *Ustilago ambiens* Karst., *Entyloma ambiens* Johan., (Schizonella melanogramma); *Ustilago americana* Speg. and *Ustilago hilariae* Henn. and *Ustilago stenotaphri* of both Hennings and Massee (Ustilago affinis); *Ustilago andropogonis-saccharoides* Henn. (Sphacelotheca andropogonis-hirtifolii); *Ustilago apiculata* Ell. & Gall. (Tolyposporella brunkii); *Ustilago caricicola* Tr. & Earle (Ustilago olivacea); *Ustilago caricis* var. *douglasii* Shear. (Cintractia caricis); *Ustilago cylindrica* Pk. (Sphacelotheca ischaemi); *Ustilago eriocauli* Clint. *Cintractia eriocauli* Mass., (Ustilago eriocauli [Mass.] Clint.); *Ustilago filifera* Nort. (Ustilago hieronymi); *Ustilago fimbristylis* Thuem. (Cintractia axicola); *Ustilago holwayi* Diet. (Ustilago lorentziana); *Ustilago insularis* Henn. (Ustilago panici-leucophaei); *Ustilago juncicola* Speg.? (Cintractia montagnei); *Ustilago liebmanni* Henn. (Cintractia junci?); *Ustilago washingtoniana* Ell. & Ev. (Ustilago striaeformis).

The following species reported or described from North America are excluded from the Ustilagineae in this paper. The genera Cerebella and Graphiola, which have had several species reported from this country and which are usually placed by American botanists in this group, are omitted as not properly belonging here.

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Ustilago arenariae Ell. & Ev. on Arenaria congesta from Colorado is certainly not an Ustilago but has the appearance of ascomycetous spores merely mechanically adhering to the host. Ustilago cyanea, parasitic on Balsamea vulgaris, was found in California by Harkness and made the basis of anew genus, Sporophaga, with possible relationship to the Uredineae or Ustilagineae. It may possibly belong with the Chytridineae but certainly not with the Ustilagineae. Ustilaginoidea oryzae (Pat.) Bref. has been reported in this country on imported rice seed. Brefeld's later work has shown that this genus does not belong with the Ustilagineae. Ustilago flavo-nigrescens B. & C. on Scleria sp. from Cuba and Ustilago viridis Ell. & Ev. on Setaria sp. from Louisiana appear, from an examination of authentic specimens, to be the sclerotial stages of species of Ustilaginoidea, the latter probably being the same as Ustilaginoidea setariae Bref. These species are therefore excluded. Ustilago ficuum on figs and Ustilago phoenicis on dates, both not uncommon in markets and Ustilago fischeri on kernels of corn (reported from Jamaica) are now known to be species of Sterigmatocystis. Sorosporium borrichiae Ell. & Ev. on Borrichia argentea from the island of Cozumel, off Yucatan, has been examined by the writer and likewise seems to be a species of Sterigmatocystis, appearing on the host apparently because the flower heads were dried under unfavorable conditions of moisture. Ustilago gynerii Vize on Gynerium argenteum from California was long ago shown to be a species of Gymnosporium. Entyloma alsines Hals. on Stellaria media from New Jersey seems not to be an Entyloma, at least a careful examination of the type material in several exsiccati and that received especially for examination failed to show any spore stage except the Cercospora-like conidia on the surface of the leaves. The writer is indebted to Bresadola for type material of Doassansia sintensii Bres. on Cedro matchos from Porto Rico. This is certainly no Doassansia. The diseased leaves are coriaceous and therefore not of the type infected by this genus; besides this, the discolored spots show nothing to indicate definitely what caused them. Doassansia zizaniae on old stems of Zizania aquatica and Burrillia globulifera occurring on similar parts of Glyceria fluitans, both described by Davis from Wisconsin, do not seem to be true Ustilagineae but are more probably sclerotial stages of species of Ascomycetes. Ustilago osmundae Pk., reported on Osmunda regalis first from New York and later from other eastern states, probably belongs with the Hyphomycetes instead of the Ustilagineae. This curious species needs further study. Ustilago panici-miliacei (Pers.) Wint. has been reported erroneously in this country, having been confused with Sorosporium syntherismae.

Sphacelotheca has been extended by the addition of a number of species usually placed under Ustilago. A few species have also been changed from Ustilago to Cintractia. Sphacelotheca and Cintractia are not considered good genera by some botanists though apparently they deserve such recognition. As considered here Sphacelotheca is characterized by the possession of a false membrane of definite sterile fungous cells, that envelopes the sorus before its rupture. Groups of these sterile cells are also often found within the spore-mass. There is also present a central columella, usually composed of the remains of the plant tissues, and the spore mass when young shows a centripetal development around this. Because of this method of spore development certain of these species, as well as a few Ustilagos, have been placed under Cintractia by some botanists. Cintractia (including Anthracoidea of Brefeld), however, is characterized by spores, usually of a peculiar black-brown color, that develope gradually in a centripetal manner forming a sorus that remains rather permanently and firmly agglutinated. Species of this genus also often have more or less evidence of a false membrane and a columella. They occur usually on the Cyperaceae or on related families. The genus Thecaphora, as considered here, includes those species whose rather firmly united spore-balls consist of reddish-brown spores smooth on the contiguous surfaces but variously marked on the free. So far as is known the germination is by elongated germ tubes that usually produce solitary terminal conidia. Sorosporium, with which it has been confused, has spores much like Ustilago and the spore-balls are often only temporarily united. Burrillia has been made to include those Doassansia-like species that lack a true cortex.

The writer wishes to express his especial obligation to Professors Farlow and Thaxter, of Harvard, for their very great help, in many ways, in furthering his study of this group. He is also indebted to a considerable number of American and some European botanists who have furnished specimens or otherwise rendered aid. Specific acknowledgment of such aid will be made later. That a wealth of material has been available for examination is shown by the fact that every species listed from this country, except one, has been seen. Type material of all species described from North America has been examined. A great difficulty in the systematic study of the group is that with such an abundance of material one finds, in some cases, such great variation that it is often a matter of arbitrary decision as to the disposition of certain specimens or even as to the treatment of certain species. It is hoped that the minimum of errors of judgment have attended the work in this respect.

USTILAGINACEÆ.

* Spores pale to dark reddish brown (Ustilago).

USTILAGO HYPODYTES (Schl.) Fr.— Ustilago minima Arth., Bull. Ia. Agr. Coll. 1884:172. 1884. Ustilago sporoboli Ell. & Ev., Bull. Torr. Bot. Club. 24:282. 1897. Ustilago funalis Ell. & Ev., Bull. Torr. Bot. Club 24:457. 1897. Sorosporium williamsii Griff., Bull. Torr. Bot. Club 29:296. 1902.

Hosts: Agropyron occidentale, Mont., S. Dak.; Distichlis maritima, Nev., Ore., Tex.; Elymus canadensis, Ia.; E. condensatus, Nev., Ore., E. sitanion, Wash.; E. striatus, Mont.; Oryzopsis cuspidata, — ; Sporobolus cryptandrus, Colo. (type U. sporoboli); Sporobolus sp., Calif.; Stipa comata, Mont., Neb.; Sicoronata, Calif.; S. eminens, Calif.; S. occidentale, Ore.; S. richardsonii, Wyo. (type S. williamsii); S. setigera, Calif., Tex.; S. spartea, Ia. (type U. minima), Ill., S. Dak.; S. viridula, S. Dak.; Stipa sp., Utah, Wash.

When the spores of this species begin to germinate they often swell in size and split off a cap from the epispore or else crack irregularly. Sorosporium williamsii seems to be merely this condition of this species. The so-called spore-balls are nothing more than a mechanical adhering of irregular masses of the spores that is often met with in Ustilago where the specimens have dried under certain conditions.

USTILAGO LONGISSIMA (Sow.) Tul.— Hosts: Glyceria arundinacea, Ia.. Minn.; G. grandis, Mass., Mich., N. Y., Verm.; Glyceria sp. N. H.

The spores of the American specimens of this species average slightly larger than those from Europe even on the same host.

USTILAGO LONGISSIMA var. MACROSPORA Davis. — Hosts: Glyceria fluitans, Ill., Me., Wis. (type); G. laxa, Me.

The form on G. laxa from Maine is somewhat intermediate between this and the species.

USTILAGO MEXICANA Ell. & Ev.— Host: Muhlenbergia sp., Mex. (type).

USTILAGO HORDEI (Pers.) Kell. & Sw. Host: Hordeum sp. cult. More or less commonly found where barley is grown.

USTILAGO LEVIS (Kell. & Sw.) Magn.— Host: Avena sativa. Conn., Ia., Ill., Kans. (type), Ohio, Wis., W. Virg.

This species is often confused with Ustilago avenae. While probably not so common as that species it is much more common than the reported distribution would indicate.

USTILAGO PERENNANS Rostr.— Cintractia avenae Ell. & Tr., Journ. Myc. 6:77. My. 1890.

Host: Arrhenatherum avenaceum, Conn., Ia., Ill., Miss. (type Cintractia avenae Ell. & Tr.), Ohio, Verm.

USTILAGO AVENAE (Pers.) Jens.— Hosts: Avena fatua Calif.; A. sativa, commonly distributed over N. Amer. where oats are grown.

USTILAGO NUDA (Jens.) Kell. & Sw. — Host: Hordeum sps. cult., commonly found where barley is raised as a farm crop.

USTILAGO TRITICI (Pers.) Jens. — Host: Triticum vulgare, a common parasite on this host in North America.

USTILAGO MUHLENBERGIAE Clint. n. sp.—Sori in the inflorescence, ovoid to subspherical, about 3-6 mm. in length, protected by thin, semi-transparent membrane of the infected enveloping glumes, upon rupture disclosing black-brown dusty spore mass; spores rather dark reddish brown, chiefly spherical, with brittle epispore that breaks up into very small granular echinulations (especially at opposite sides of the spore thus leaving a darker less broken central band) 4-6 μ in diameter.

Host: Muhlenbergia texana, Ariz. (type).

The writer is indebted to Professor Farlow for this species which was collected by Pringle in southern Arizona in 1884. It is peculiar because of its very small spores and because of the curious way, as shawn by an immersion, in which the epispore breaks into granular echinulations. The germination of the spores has not been observed.

USTILAGO RESIDUA Clint. n. sp. — Ustilago segetum Auct. p. p. Ustilago segetum f. Danthoniae Ell. and Ev. N. A. F. 1893a. 1887.

Sori prominent, in the inflorescence, infecting the whole, or sometimes confined to the individual spikelets, usually enclosed by leaf sheaths, on exposure showing as olive brown dusty spore mass; spores rather light olive brown, ovoid or ovate to spherical or occasionally irregular, thin walled, with coarse granules giving granular reticulate appearance, usually 5.5-8.5μ, sometimes even 11μ in length.

Hosts: Danthonia compressa N. Y.; D. spicata, N. H.; Danthonia sp., Colo.

This is near Ustilago tritici but has spores more granular reticulate, averaging larger and not lighter colored on one side. It is one of the forms that have been included in the old species Ustilago segetum, and, so far as the writer can ascertain, has not, as yet, been given specific distinction. Ustilago danthoniae Kalchb., if described accurately, differs decidedly in its much larger spores.

USTILAGO AFFINIS Ell. & Ev. — Ustilago affinis Ell. & Ev. Bull. Torr. Bot. Club, 20:297. 1893. Ustilago hilariae Henn., Hedw. 37:267. 1898. Ustilago stenotaphri Henn., Hedw. 37:293. 1898. Ustilago americana Speg., Fung., Argent. Nov. Vel. Crit. no. 375. 1899. Ustilago stenotaphri Mass. Kew Bull. 153-4:184. 1899. Ustilago henningsii Sacc. & Syd., Syll. Fung. 16:368. 1902.

Hosts: Hilaria cenchroides, Mex. (type U. hilariae Henn.); Stenotaphrum americanum, Bermuda, Jamaica (type).

This fungus has been described a number of times during recent years by different botanists. The first named applied to it is apparently that used by Ellis and Everhart in 1893. Ustilago hilariae Henn. on Hilaria sp. does not seem distinct from the form on Stenotaphrum and so they have been placed together here. Ustilago stenotaphri of McAlpine is apparently a distinct species which was described in 1895.

USTILAGO LORENTZIANA Thüm.— Ustilago holwayi Diet., Bot. Gaz. 18:253. 1893.

Hosts: Hordeum jubatum, Mont., N. Dak., S. Dak.; H. maritimum, Ida.; H. murinum, Calif.; H. pratense, Calif. (type U. holwayi), Utah; H. pusillum, Calif.; Hordeum sp., Calif., Wash.

Dietel's Ustilago holwayi does not seem to be specifically different from de Thümen's species if one takes into consideration the variations that are met with in specimens from this country, some of which agree exactly with the South American type of the species.

USTILAGO BROMIVORA (Tul.) Fisch. d. Waldh.— Cintractia patagonica Cke. & Mass., Grev. 18:34. 1889.

Hosts: Bromus arvensis, Colo.; ? B. breviaristatus, Calif., Ia.; B. ciliatus, Colo.; B. hookerianus, Calif., Wash.; B. hordeaceus var. glabrescens, Wash.; B. kalmii, Utah; B. marginatus, Colo., Ore., Wy.; B. mollis, Wash.; B. racemosus, Wash.; B. secalinus, Calif., Ore.; B. vulgaris, Mont.; B. vulgaris var. eximius, Wash.

An examination of the type of Cintractia patagonica shows it to be only an unusually vigorous form infecting the basal parts of the outer glumes as well as the inner parts.

USTILAGO BROMIVORA var. MACROSPORA Farl.— Host: Bromus ciliatus, Colo (type), Ia.?

This seems entitled only to varietal rank though the spores are much larger than those ordinarily possessed by the species. Specimens have been found on the same host that apparently belong to the species rather than this variety.

USTILAGO CRAMERI Körn.—Host: Setaria italica, Ill., Ohio, N. Dak., S. Dak.

USTILAGO PANICI-PROLIFERI Henn.—Host: Panicum proliferum var. acuminatum, Mex. (type).

USTILAGO PANICI-LEUCOPHAEI Bref.—Ustilago insularis Henn. Hedw. 35:51. 1896.
Host: Panicum leucophaeum, Jamaica.

USTILAGO ULEI Henn.—Host: Chloris submutica, Mex.

USTILAGO CHLORIDICOLA Henn.—Host: Chloris sp., Calif. (type).

USTILAGO TILLANDSIAE Patters. n. sp.—Sori destroying inner flower parts, protected by enclosing bracts and perianth, forming an irregular dusty black spore mass about 1-3 cm. in length; spores olive brown, chiefly ovoid to spherical, thin walled, more or less collapsed or hemispherically cupped, smooth or with brittle epispore breaking up into thin polygonal areas, 7-13 μ in length.

Hosts: Tillandsia leiboldiana, Mex.; Tillandsia sp., Costa Rica (type).

The writer first learned of this species through Mrs. Flora W. Patterson of the Department of Agriculture and later on searching in the Gray Herbarium found it on specimens from Mexico. It is somewhat questionable whether the species is a true Ustilago or some Hyphomycete having the appearance of a smut, though it is more probably the former. A study of the method of spore production and germination may be necessary to determine its true position.

USTILAGO OLIVACEA (DC.) Tul.—Ustilago caricicola Tr. & Earle, Bull. Torr. Bot. Club 26:493. 1899.
Hosts: Carex folliculata, Miss. (type U. caricicola); C. polystachya, Mex.; C. utriculata, Wash.; Carex sp., Mex.

USTILAGO SPARSA Underw. — Host: Dactyloctenium aegyptiacum, Ala. (type), S. Car.
This is issued in Ravenel's Fungi Amer. No. 790 as Ustilago destruens Schl.

USTILAGO SPERMOPHORA B. & C.—Hosts: Eragrostis major, Ia., Ill., Ind., Kans., Mass., Miss., Neb., N. Car., N. Y., S. C. (type), S. Dak., Wisc.; E. reptans, D. C., S. Dak.

USTILAGO BOUTELOUAE Kell. & Sw.—Host: Bouteloua oligostachya, Kans. (type), Okl.

USTILAGO TRICUSPIDIS Ell. & Gall. n. sp.—Sori in ovaries, ellipsoidal, about 4 mm. in length, infecting an occasional spikelet and showing between the spreading glumes; spores medium reddish brown, ovoid to chiefly subspherical or spherical, rather prominently verruculo-echinulate, chiefly 8-11 μ in length.

Host: Triodia cuprea (Tricuspis seslerioides), Mo. (type).

This species bears the above name in the U. S. Dept. Agr. Herbarium and is evidently new. The writer is indebted to Mrs. Flora W. Patterson for the privilege of examining specimens. The fungus was collected by M. B. Waite at Charleston, Mo., in the fall of 1889. It is related to Ustilago spermophora but has spores that are more regular, more prominently verruculo-echinulate and darker colored.

USTILAGO MINOR Nort.—Host: Bouteloua hirsuta, Kans. (type).

Griffiths has listed a number of additional hosts for this species but they seem to the writer, who has examined the type of the species, to come more properly under Ustilago hieronymi. The specimens assigned to these two species show such variation that it is difficult to determine where the specific lines should be drawn.

USTILAGO HIERONYMI Schröt.—Ustilago filifera Nort., Trans. Acad. Sci. St. Louis 7:237. 1896.

Hosts: Bouteloua aristidoides Ariz., Mex.; B. bromoides, Ariz.; B. eriopoda, Ariz.; B. oligostachya, Ariz., Kans. (type U. filifera), Mont.; B. polystachya, Ariz.; B. racemosa, Kans. (type U. filifera), Tex.; Pappophorum wrightii, Ariz.

Perhaps some of the larger spored forms (on B. oligostachya for instance) deserve specific recognition. The writer is also somewhat in doubt about the specific position of the specimens issued by Griffiths in his West American Fungi on Pappophorum wrightii and Bouteloua polystachya as in both of these cases the sori are in the aborted inflorescence instead of on the leaves.

USTILAGO BUCHLOES Ell. & Tr. — Host: Buchloe dactyloides, Neb., N. Mex. (type).

Further study may possibly show this to be the same as the last species.

USTILAGO PUSTULATA Tr. & Earle.—Hosts: Panicum proliferum, Ia., Ill., Kans., Miss. (type); P. virgatum, Tex.

USTILAGO SPHAEROGENA Burr.—Host: Panicum crus-galli. Conn., Ia., Ill. (type), Neb.

USTILAGO CRUS-GALLI Tr. & Earle.—Ustilago crus-galli Tr. & Earle, Bull. Torr. Bot. Club 22:175. 1895. Cintractia seymouriana Magn. Ber. Deut. Bot. Ges. 14:217. 1896. Cintractia crus-galli Magn., Ber. Deut. Bot. Ges. 14:392, 1896.

Host: Panicum crus-galli, Ark., Ill., Mass., Minn., Ore., S. Dak., Utah (type), Wash.

Magnus has placed this species under the genus Cintractia because of the method of spore formation. As considered here

Cintractia is limited to species possessing quite a different type of spores.

USTILAGO ZEAE (Beckm.) Ung.—Hosts: Euchlaena luxurians, Ala., Ia., Ill., Kans., Wisc.; Zea mays, common throughout N. Amer.

USTILAGO PANICI-GLAUCI (Wallr.) Wint.—Ustilago neglecta Niessl, Rab. Fungi Eur. 1200. 1866.

Host: Setaria glauca, Conn., Ia., Ill., Ind., Kans., Mass., Neb., N. H., N. J., N. Y., Ohio, S. Dak., Verm., Wisc.

USTILAGO UNIOLAE Ell. & Ev.—Host: Uniola gracilis, Miss., Tex. (type).

USTILAGO ERIOCAULI (Mass.) Clint.—Cintractia eriocauli Mass. Grev. 22:67. 1894. Ustilago eriocauli Clint., Rhodora 3:82. 1901.

Host: Eriocaulon septangulare, Mass. (type U. eriocauli Clint.), N. H., Conn.

This was described by the writer in 1901 as a new species, as it was considered distinct from Cintractia eriocauli on Eriocaulon fenestratum, described by Massee from Madagascar. Since then specimens of the latter have been received from Massee and the two prove to be the same. Massee's original description is at fault in that it gives the spores as smooth when they are distinctly verruculose; the fungus, also, seems to come more properly under Ustilago than under Cintractia.

USTILAGO ORNATA Tr. & Earle.—Host: Leptochloa mucronata, Miss. (type).

USTILAGO SPOROBOLI Tr. & Earle.—Host: Sporobolus junceus, Miss. (type).

USTILAGO VILFAE Wint.—Host: Sporobolus vaginaeflorus, Kans., Penn. (type).

USTILAGO RABENHORSTIANA Kühn.—Hosts: Panicum filiforme, N. J., Mex.; P. glabrum, Ill., Kans., Minn., N. H.; P. sanguinale, Ala., Conn., D. C., Ia., Ill., Ind., Kans., Mary., Mass., Miss., Mo., Neb., N. J., Ohio, N. Car., Tex., Wisc.; Panicum sp., N. Y., S. Car.

USTILAGO HOLWAYANA Henn.—Host: Paspalum velutinum, Mex. (type).

USTILAGO MULFORDIANA Ell. & Ev.—Tilletia mixta Mass., Kew Bull. 153-4:145. 1899.

Hosts: Festuca tenella, Ariz., Ida., Mont., Ore., Wash., Wyo.; Festuca sp., Calif., Ida. (type).

USTILAGO HILARIAE Ell. & Tr.—Uredo hilariae Sacc., not Ell. & Tr., Syll. Fung. 9:333. 1891.
Host: Hilaria jamesii, Colo., N. Mex. (type).

USTILAGO AEGOPOGONIS Henn.—Host: Aegopogon cenchroides, Mex. (type).

USTILAGO ELEGANS Griff.—Host: Chloris elegans, Ariz. (type).

USTILAGO DIETELIANA Henn.—Host: Tripsacum dactyloides, Mex. (type).

USTILAGO STRIAEFORMIS (West.) Niessl.—Tilletia striaeformis Oud., Bot. Zeit. 36:440-1. 1878. Ustilago washingtoniana Ell. & Ev., Bull. Torr. Bot. Club 22:57. 1895.
Hosts: Agrostis alba var. vulgaris, Conn., Ia., Ill., Mo.; Ammophila arundinacea, Mass.; Elymus canadensis var. glaucifolius, Wisc.; E. virginicus, Ill.; Phleum pratense, Ia., Ill., Ind., Mass., Mo., Ohio, N. J., N. Y., Wisc., Can.; ? Poa annua, Mass.; P. pratensis, Ia., Ill.; Unknown grass, Mass., N. J., N. Y., Tex., Wash. (type U. washingtoniana).

USTILAGO CALAMAGROSTIDIS (Fckl.) Clint. n. nom. — Tilletia calamagrostis Fckl., Symb. Myc.: 40. 1869.
Hosts: Calamagrostis canadensis, Verm.; C. canadensis var. acuminatus, Wyo.; C. pickeringii, N. Y.

USTILAGO MACROSPORA Desm.— Ustilago macrospora Desm., Pl. Crypt. II, 1727. 1850. Tilletia serpens Karst., Fung. Fenn. 599. 1886. Tilletia aculeata Ule, Verh. Bot. Ver. Prov. Brand. 25: 213. 1884.
Host: Agropyron repens, Ia., Mass., Wisc.

USTILAGO ECHINATA Schröt.— Host: Phalaris arundinacea, Neb., Wash.

USTILAGO TULIPAE (Heufl.) Wint.— Ustilago erythronii Clint., Bull. Buff. Soc. Nat. Sci. 1:67. 1873.
Host: Erythronium americanum, Mo., N. J., N. Y. (type U. erythronii), Penn.

** Spores golden. (Ustilago.)

USTILAGO VAILLANTII Tul.— Host: Scilla praecox, Mass.

USTILAGO OXALIDIS Ell. & Tr.—Host: Oxalis stricta, Conn., Ill., Miss. (type), Mo., N. Y., Wisc.

*** Spores lilac to purple. (Ustilago.)

USTILAGO KOENIGIAE Rostr. — Host: Koenigia islandica, Greenland (type).

USTILAGO VINOSA (Berk.) Tul. — Host: Oxyria digyna, Calif., Greenl.

USTILAGO VIOLACEA (Pers.) Fckl.—Hosts: Arenaria groenlandica, Me., N. H., N. Y.; A. lateriflora var. glabrescens, Wash.; Cerastium maximum, Alaska; Lychnis sp., Minn.; Silene acaulis, N. H.; S. douglasii var. macounii, Mont.; S. multicaulis, Wash.; S. tetonensis, Wyo.; S. watsoni, Calif., Wash; Stellaria borealis, Greenl.

USTILAGO VIOLACEA var. MAJOR Clint. n. var.— Sori inconspicuous, filling swollen anthers, soon rupturing and disclosing violet colored dusty mass of spores; spores pale lilac to violet, ovoid to spherical, occasionally somewhat irregular, with rather conspicuous spore wall covered with numerous minute reticulations (1 μ or less in diameter), chiefly 7-12 μ in length.

Host: Silene watsoni, Wash. (type).

European botanists seem inclined to keep Schroeter's species of Ustilago major on Silene otites distinct from Ustilago violacea. The spores of the variety described here are much like those of the former species and if the two are the same it seems doubtful if the European form on Silene otites deserves specific rank. This variety represents the extreme variation from the species as found in this country. Silene watsoni is also a host for the species.

USTILAGO GAYOPHYTI Hark.— Host: Gayophytum ramosissimum Calif. (type), Ore.

USTILAGO ANOMALA Kze.— Hosts: Polygonum cilinode, Me., N. H., N. Y., Verm.; P. convolvulus, Ill.; P. dumetorum var. scandens, Ind., Mo., Verm., W. Virg.

USTILAKO UTRICULOSA (Nees.) Tul.— Hosts: Polygonum acre, Ill., Kans., Miss.; P. amphibium, Ind., Penn.; P. aviculare, Calif.; P. erectum, Miss.; P. hydropiper, Ala., Conn., Ia.; P. hydropiperoides, Conn., Miss., Verm.; P. lapathifolium, Ill.; P. lapathifolium var. incarnatum, Ia., Ill.; P. pennsylvanicum, Ala., Ia., Ill., Kans., Mass., Miss., Mo., Neb., N. H., N. J., N. Y., Ohio, R. I., Verm., W. Virg.; P. sagittatum, N. Y.; Polygonum sp., Ill., Mass., Mich., Mo., N. Car., N. J., R. I., Mex.

On some of these hosts, especially those growing in moist situations, as Polygonum acre and Polygonum hydropiperoides, the smut approaches very closely to Ustilago anomala.

USTILAGO KUEHNEANA Wolff. — Host: Rumex acetosella, S. Car.

USTILAGO PARLATOREI Fisch. d. Waldh. — Hosts: Rumex britannica, Mo., Neb.; R. mexicanus, Mex.

USTILAGO BISTORTARUM (DC.) Körn.— Host: Polygonum viviparum, Colo., Wyo., Greenl.

SPHACELOTHECA PAMPARUM (Speg.) Clint. n. nom.— Ustilago setariae Niessl?, Speg. Fung. Argent. pug. 2 no. 24. 1880. Ustilago pamparum Speg., Fung. Guar. pug. 1:49. 1886. Ustilago kolaczekii Kuhn, Rab-Wint. Fungi Eur. 3401. 1886.

Host: Setaria sp., Mex.

SPHACELOTHECA DIPLOSPORA (Ell. & Ev.) Clint. n. nom.— Ustilago diplospora Ell. & Ev., Journ. Myc. 6:119. 1891.

Hosts: Panicum crus-galli, Ill.; P. sanguinale, Miss. (type).

SPHACELOTHECA SORGHI (Lk.) Clint. n. nom.— Ustilago sorghi Pass., Hedw. 12:114. 1873. Cintractia sorghi-vulgaris Clint., Bull. Ill. Agr. Exp. Stat. 47:404. 1897.

Hosts: Sorghum vulgare and vars., Ala., Calif., Conn., D. C., Ia., Ill., Kans., Neb., N. J., N. Y., Ohio, S. Dak., Wisc., Jamaica, Ontario.

SPHACELOTHECA ISCHAEMI (Fckl.) Clint. n. nom.— Ustilago ischaemi Fckl., Enum. Fung. Nass. 22. 1861. Ustilago cylindrica Pk., Bot. Gaz. 7:55. 1882. Cintractia ischaemi Syd., Oesterr. Bot. Zeit. 51:12. 1901

Hosts: Andropogon contortus, Mex.; A. furcatus, Kans.; A. saccharoides Ariz., Mex.; A. scoparius, Ill.; Andropogon sp., Ariz. (type U. cylindrica).

SPHACELOTHECA PASPALI-NOTATI (Henn.) Clint. n. sp.— Ustilago paspali-notati Henn., n. sp. in Herb. Holway.

Sori in the inflorescence, linear, about 4-6 cm in length, with evident false membrane gradually flaking away from apex and exposing reddish brown dusty spore mass surrounding evident often forked columella; sterile cells hyaline, with those of the membrane adhering rather firmly, with inner loose ones in roundish clusters, usually larger than the spores; spores light reddish brown, ovoid to spherical or slightly angled, apparently smooth but very minutely verruclose, 7-10 μ in length.

Host: Paspalum notatum, Mex. (type).

This species is very near Sphacelotheca ischaemi, in fact is scarcely to be distinguished from the verruculose forms of that species, though it has a more luxuriant sorus and different host. For this reason there may be some question if it is entitled to the specific rank given it by Hennings.

SPHACELOTHECA MONILIFERA (Ell. & Ev.) Clint. n. nom. — Ustilago monilifera E. & Ev., Bull. Torr. Bot. Club 22:362. 1895. Ustilago andropogonis-contorti Henn., n. sp., in Herb. Holway.

Hosts: Andropogon contortus, Ariz. (type), Mex. (type U. andropogonis-contorti Sandw. Isl.

It is possible that Ustilago nealii Ell. & And. is the same as this species. It is a true Sphathelotheca but the writer has not decided definitely if it comes here or is distinct.

SPHACELOTHECA ANDROPOGONIS-HIRTIFOLII (Henn.) Clint. n. nom.— Ustilago andropogonis-hirtifolii Henn., Bot. Gaz. 28:274. 1899. Ustilago andropogonis-saccharoidis Henn., Syd. Ust. 251. 1901.

Hosts: Andropogon hirtifolius pubiflorus, Mex. (type); A. saccharoides, Mex. (type U. andropogonis-saccharoidis).

SPHACELOTHECA OCCIDENTALIS (Seym.) Clint. n. nom. — Sorosporium ellisii var. occidentalis Seym., Ell. & Ev. N. A. F. 2265. F. 1889. Ustilago andopogonis Kell. & Sw., Journ. Mycol. 5:12-13. Mr. 1889.

Hosts: Andropogon furcatus, Kans. (type U. andropogonis), N. Dak. (type), Neb.; A. hallii, Kansas (type U.) andropogonis, Neb.; A. hallii var. flaveolus, Ill. (cult.); A. macrourus, Calif.

SPHACELOTHECA MONTANIENSIS (Ell. & Holw.) Clint. n. nom. — Ustilago montaniensis Ell. & Hollw., Ell. & Ev. N. A. F. 2263. 1899. Described in Journ. Mycol 6:19, 1891.

Hosts: Muhlenbergia glomerata, Mont.; M. glomerata var. setiformis, Mont,; Muhlenbergia sp., Mont. (type).

SPHACELOTHECA REILIANA (Kühn) Clint. n. nom. — Ustilago reiliana Kühn, Rab. Fung. Eur. 1998. 1875. Cintractia reiliana Clint., Bull. Ill. Agr. Exp. Stat. 57:346. 1900.

Hosts: Sorghum vulgare, Ia., Ill., Kans., Minn., Miss., Neb., N. J., Ohio, Tex.; Zea mays, Kans., Ohio.

SPHACELOTHECA HYDROPIPERIS (Schum.) DeBy. — Hosts: Polygonum acre, Ill., Mass.; P. bistortoides, Wash., Wyo.; P. hydropiper, Neb., R. I.; ? P. persicaria, N. Y.; P. sagittatum, Ia., Ill., Me., N. Y., Verm., W. Virg.; P. viviparum, Wyo., Greenl.; Polygonum sp., Mo.

MELANOPSICHIUM AUSTRO-AMERICANUM (Speg.) Beck.— Ustilago austro-americana Speg., Fung. Argent. pug. 4, n. 45. 1881. Melanopsichium austro-americanum Beck, Ann. Natur, Hofmus. Wien, 9:22. 1894.

Hosts: Polygonum aviculare, Calif.; P. hydropiper, D. C., Mo.; P. lapathifolium, Calif., Ill.; P. lapathifolium var. incarnatum, Ill., Mo.; P. pennsylvanicum, Ill., Kans., Mo., N. Y.; ?P. virginianum, Mo.; Polygonum sp., D.C., Ia., Mo., N. J., Tex.

CINTRACTIA TAUBERTIANA (Henn.) Clint. n. nom.—Ustilago taubertiana Henn., Engl. Bot. Jahrb. 17:525. 1893.

Hosts: Rhynchospora alba, Mass., N. J.; R. cephalantha, Miss.; R. fascicularis, Fla.; R. inexpansa, S. Car.; Rhynchospora, ? Tex.

This smut has smaller and usually lighter colored spores than Cintractia montagnei.

CINTRACTIA MONTAGNEI (Tul.) Magn.—Ustilago caricis Auct. p.p. ?Ustilago juncicola Speg., Fungi Guar. 15. 1891.

Hosts: Rhynchospora alba, Me., Newf., N. Y., Verm.; R. eximia, Mex.; R. glomerata, Mass., Miss., N. Y.; R. tenuis, Mex.; Rhynchospora sp., N. Car., S. Car.

CINTRACTIA PSILOCARYAE (Tr. & Earle) Clint. n. nom.—Ustilago psilocaryae Tr. & Earle, Bull. Torr. Bot. Club 26:493. 1899.

Hosts: Psilocarya nitens, Fla., Miss. (type); P. scirpoides, Mass., R. I.

CINTRACTIA CARICIS (Pers.) Magn.—Ustilago caricis Ung., Einfl. Bodens 211. 1836. Anthracoidea caricis Bref., Unters. Gesammt. Myk. 12:144. 1895. Cintractia caricis Magn., Abh. Bot. Ver. Prov. Brand. 37:78. 1896. Ustilago caricis douglasii Shear, Fungi Col. 1485. 1901.

Hosts: Carex sps., distributed over North America; Kobresia caricina, N. Amer.; K. scirpina, Greenl.; Scripus caespitosus, Greenl.

The writer has listed this smut on over forty species of Carex.

CINTRACTIA EXTERNA (Griff.) Clint. n. nom.—Tilletia externa Griff., Bull. Torr. Bot. Club 29:290. 1902.

Host: Carex filifolia, Mont. (collected by F. W. Anderson, Apr. 1888 at Sand Coulee), Neb. (collected by T. A. Williams, June 23, 1890, at War Bonnet Canon), Wyo. (type T. externa).

This species was first collected nearly fifteen years ago by Anderson who distributed it to several herbaria under the name of Ustilago caricis. Later it was collected by Williams. Recently it has been described from Wyoming, as a new species, by Griffiths. The writer had it described (in manuscript) as a new species when Griffiths description came to hand. It is related to C. caricis but differs by having more regular, smooth spores with evident hyaline enveloping membranes. These membranes are evidently hygroscopic and by means of the absorbed water the spores are shed, becoming glued over the adjacent parts. When dry the spores are very firmly agglutinated in the sorus.

CINTRACTIA SUBINCLUSA (Körn.) Magn.—Ustilago subincluse Körn., Hedw. 13:159. 1874. Anthracoidea subinclusa Bref., Unters. Gesammt. Myk. 12:146. 1895. Cintractia subinclusa Magn., Abh. Bot. Ver. Prov. Brand. 37:79. 1896.

Hosts: Carex lanuginosa, Nev.; C. michauxiana, Brit. Amer., New Bruns.; C. oligosperma, Newf.; C. trichocarpa var. deweyi, N. Dak.; C. utriculata, Nev., Ore.

CINTRACTIA LUZULAE (Sacc.) Clint. n. nom.—Ustilago luzulae Sacc., Myc. Ven. Spec. 73. 1873.

Host: Luzula campestris, Ind.

CINTRACTIA JUNCI (Schw.) Trel. — Hosts: Juncus acuminatus, Miss.; J. effusus, N. J.; J. tenus, Conn., Ia., Ill., Mass., Ohio, N. J., N. Y., Penn. (type), Verm., Wisc.; Juncus sp., Mass., N. Car., Mex.

CINTRACTIA AXICOLA (Berk.) Cornu.—Ustilago axicola Berk., Ann. Mag. Nat. Hist. II, 9:200. 1852. Ustilago fimbristylis Thm., Bull. Torr. Bot. Club 6:95. 1876. Cintractia axicola Cornu., Ann. Sci. Nat. Bot. VI, 15:279. 1883.

Hosts: Fimbristylis autumnalis, Ala., Miss., Virg. (type U. fimbristylis); Fimbristylis sp., Costa Rica, Cuba, Mex., San Domingo (type).

CINTRACTIA AXICOLA var. MINOR Clint. n. var. — Sori and spores as in the species except latter smaller, chiefly 10-13 µ in length.

Host: Cyperus grayii, N. Y.

This variety is based on the specimen issued in Ell. and Ev. N. A. F. no. 2423 as Ustilago (Cintractia) axicola Berk. Besides having a different host it differs from this species in having smaller spores. It sometimes occurs at the base of the spikelets forming a conspicuous smutty mass. In some respects it agrees with a species Spegazzini has described from South America as Cintractia peribebuyensis on Cyperus.

CINTRACTIA UTRICULICOLA (Henn.) Clint. n. sp.—Cintractia leucoderma f. utriculicola Henn., Hedw. 34:336. 1895. Cintractia axicola f. spicularum Juel, Bih K. S. Vet. Akad. Handl. 23 (3^9) :7. 1897.

Sori in ovaries, ovoid to subspherical, chiefly 3-6 mm. in length, covered by an evident whitish false membrane that ruptures irregularly from the apex disclosing semi-agglutinated black spore mass; sterile cells hyaline, chiefly subspherical, often semi-gelatinized; spores dark reddish brown, often subopaque, with irregular lighter areas, somewhat compressed laterally and therefore in cross-section appearing oblong to circular according to view, smooth, 11-16 μ in length.

Host: Rhynchospora sp., Mex.

This form is described from specimens issued in Sydow's Ustilagineen no. 220 from Mexico. The synonyms given are those that have been assigned by others, the writer not having seen type specimens of these. This Mexican collection, at least, seems to deserve specific distinction from both Cintractia axicola and Cintractia leucoderma. From the former it differs not only in the host and part infected but also in its darker colored spores and from the latter in the position and size of the sorus and in its smooth spores.

CINTRACTIA LEUCODERMA (Berk.) Henn.—Cintractia krugiana Magn. Engl. Jahrb. 17:490. 1893.

Hosts: Rhynchospora gigantea, Porto Rico (type C. krugiana), Rynchospora sp., Mex.; ?Rhynchospora, Cuba, San Domingo (type).

SCHIZONELLA MELANOGRAMMA (DC.) Schröt.—Ustilago ambiens Karst., Oefv. Svensk. Kongl. Vet. Akad. Förh. 29:108. 1873. Entyloma ambiens Johans. Oefv. Svensk. Kongl. Vet. Akad. Förh. 41^9:160. 1884.

Hosts: Carex atrata, Colo.; C. laxiflora, Ill.; C. pennsylvanica, Conn., Ia., Ill., Mass., Mich., N. Y.; Carex sp., Calif., Colo., Ind., Mich., Ore., Utah, Wyo.

The writer has received a specimen of the type of Ustilago ambiens from Karsten and it proves to be this species.

MYKOSYRINX CISSI (DC.) Beck.—Schroeteria cissi De Toni, Sacc. Syll. Fung. 7^2:501. 1888. Mykosyrinx cissi Beck, Ann. Natur. Hofmus. Wien, 9:123. 1894.

Hosts: Cissus acida, Porto Rico; C. erosa, Porto Rico; C. sicyoides, Fla., Bahamas, Jamaica, Porto Rico, San Domingo (type); Vitaceae, Haiti, Mexico.

SOROSPORIUM CONSANGUINEUM Ell. & Ev.—Ustilago aristidae Pk., Bull. Torr. Bot. Club 12:35. 1885.

Hosts: Aristida basiramea, S. Dak.; A. longiseta robusta, Neb.; A. purpurea, Neb.; A. rusbyi, Ariz. (type); A. scheideana, Ariz.; Aristida sp., Kans., Tex. (type U. aristidae).

With age the spore-balls very easily separate into the individual spores and then the fungus may be taken for an Ustilago.

SOROSPORIUM SYNTHERISMAE (Pk.) Farl.—Ustilago syntherismae Pk. (not Schw.) Ann. Rep. N. Y. St. Mus. 27:103. 1875. Sorosporium syntherismae Farl., Host Index N. A. F. 152. 1891. Sorosporium cenchri Henn, Hedw. 35:221-2. 1896.

Hosts: Cenchrus multiflorus, Mex.; C. tribuloides, Conn., Ia., Ill., Ind., Kans., Mich., Minn., Neb., N. Y., S. Dak., Tex., Wisc.; Cenchrus sp., Kans., Mex.; Panicum agrostoides, Mo.; P. capillare, Ia., Ind., Kans., Mass., Neb., S. Dak.; P. proliferum, Ia., Ill., Kans., Mo.; Panicum sp., Kans., D. C., Mo.

SOROSPORIUM ELLISII Wint.—Sorosporium syntherismae Amer. Auct. p. p.

Hosts: Andropogon scoparius, Conn., Ill., Kans.; A. virginicus, N. J. (type); Aristida dichotoma, Ohio, Penn. (type).

SOROSPORIUM EVERHARTII Ell. & Gall.—Tolyposporium everhartii Diet., Nat. Pflanzenf. 1¹**:14. 1897.

Hosts: Andropogon macrourus, Fla.; ? A. scoparius, Ala.; A. virginicus, Ala., Miss., N. J. (type).

SOROSPORIUM PROVINCIALE (Ell. & Gall.) Clint. n. sp.—Sorosporium ellisii var. provincialis Ell. & Gall., Journ. Mycol. 6:31-2. 1890.

Sori in the inflorescence, linear, often 6 or more cm. in length, concealed within the leaf sheath or the upper part protruding, with false membrane that becomes lacerated as exposed and with black brown granular spore mass; spore-balls variable, apparently gradually wearing away, chiefly 50-100 μ or possibly even longer; spores medium light reddish brown though often darker in places, rather regular, ovoid to chiefly subspherical, minutely verruculose, with thick (3 μ) uniform cell wall, 14-19 μ in length.

Host: Andropogon furcatus, Mo. (type), Neb.

This species is based on specimens No. 2425 in Ell. & Ev. N. A. F. It seems entitled to specific rather varietal rank as it is the most sharply marked off of the related species on Andropogon. It is especially distinguished by the thick uniform walls of the spores.

SOROSPORIUM RHYNCHOSPORAE Henn.—Host: Rhynchospora semiplumosa, Miss.

SOROSPORIUM GRANULOSUM Ell. & Tr.—Host: Stipa viridula, Col. (type).

THECAPHORA PILULAEFORMIS B. & C.—Thecaphora pilulaeformis B. & C., Grev. 3:58. 1874. Tolyposporium davidsonii Diet. Holw., Bot. Gaz. 19:395. 1894. Poikilosporium davidsohnii Diet., Flora 83:87. 1897. Poecilosporium davidsornii Sacc. & Syd., Syll. Fung. 16:380. 1902. Sorosporium bigeloviae Griff., Bull. Torr. Bot. Club 29:295. 1902.

Host: Bigelovia veneta, Calif. (type); Bigelovia sp., Ariz. (type S. bigeloviae).

Dietel and Holway erroneously reported the host as Atriplex. The writer has examined both the Berkeley and Curtis specimens and those of Dietel and Holway and the two prove to be the same fungus. Recently Griffiths has described the species under the name of Sorosporium bigeloviae.

THECAPHORA TRAILII Cke.—Thecaphora trailii Cke., Grev. 11:155. 1883. Thecaphora cirsii Boud., Bull. Soc. Myc. Fr. 3:149. 1887. Schizonella subtrifida Ell. & Ev., Journ. Mycol. 6:119. 1891. Poikilosporium trailii Vesterg., Micr. Rar. Sel. 452. 1902.

Host: Cnicus ochrocentrus Colo. (type S. subtrifida).

THECAPHORA CALIFORNICA (Hark.) Clint. n. nom.—Sorosporium californicum Hark., Bull. Calif. Acad. Sci. 1:161-2. 1885.

Host: Grindelia robusta, Calif. (type).

THECAPHORA CUNEATA (Schof.) Clint. n. nom.—Sorosporium cuneatum Schof., Contr., Bot. Dep. Uni. Neb. 3:48. 1892. Sorosporium solidaginis Ell. & Ev., Proc. Acad. Nat. Sci. Phil. 1893:156. 1893.

Hosts: Grindelia squarrosa, Neb. (type), Kans.; Solidago missouriensis, Kans. (type S. solidaginis).

THECAPHORA DEFORMANS Dur. & Mont.—Thecaphora deformans Dur. & Mont., Ann. Sci. Nat. Bot. III, 7:110. 1847. Thecaphora lathyri Kühn, Rab. Fungi Eur. 1797. 1873. Thecaphora affinis Schneid., Jahrb. Schles. Ges. Vat. Kult. 1874:90. 1874. Sorosporium desmodii Pk., Bot. Gaz. 3:35. 1878. Sorosporium astragali Pk., Bot. Gaz. 4:218. 1879. Thecaphora astragali Wor., Abh. Senck. Nat. Ges. 12:579. 1882. Thecaphora desmodii Wor., Abh. Senck. Nat. Ges. 12:579. 1882.

Hosts: Astragalus bisulcatus, Colo.; A. drummondii, Colo. (type S. astragali); A. multiflorus, Utah; A. scopulorum, Colo.; Desmodium acuminatum, N. J. (type S. desmodii); D. nudiflorum, Mary., Penn.; Hosackia parviflora, Wash.; Lupinus sp. Colo.; Trifolium tridentatum, Calif.

THECAPHORA MEXICANA Ell. & Ev. n. sp.—Sori on stems, prominent, forming clustered subglobose pustules each about 4 mm. in diameter, firm, upon rupture scattering dusty umber spore mass and leaving behind the remains of the hollowed pustules; spore-balls light reddish yellow, ovoid to spherical, composed of 15-30 spores separated by prominent hyaline areas that apparently widen with maturity, 50-90 μ in length; spores angular when young but with age becoming more rounded, irregular, oblong to polyhedral or subpherical, with distinct inner and outer coats, the latter thick and provided with prominent irregular papillae, chiefly 16-22 μ, most elongated rarely 25 μ in length.

Host: Guardiola platyphylla, Mex. (type).

This interesting species bears the above name in the U. S. Dept. Agr. Herb. (Div. Veg. Path. & Phys.) and is evidently new. It was collected by Dr. Palmer in Mexico. The pustules are larger and more clustered than those formed by Thecaphora pilulaeformis. The hyaline intersporal areas are peculiar and it is probable that by further gelatinization of these the spores become separated. In the younger conditions the spore-balls are imbedded in the prominent semi-gelatinized mycelium. The germination of the species is not known.

THECAPHORA ATERRIMA Tul.—Sorosporium atrum Pk., Bot. Gaz. 5:35. 1880. Tolyposporium aterrimum Diet., Nat. Pflanzenf. 1^{1**}:14. 1897.

Hosts: Carex adusta, Ia.; C. pennsylvanica, Colo. (type S. atrum), Kans.; Carex sp., Ia.

There is some doubt as to the true generic position of this species. Dietel places it under Tolyposporium.

TOLYPOSPORELLA BRUNKII (Ell. & Gall.) Clint. n. nom.—Ustilago (Sorosporium?) brunkii Ell. & Gall., Journ. Mycol. 6:31. 1890. * Ustilago apiculata Ell. & Gall., Tex. Agr. Exp. Sta. Bull. 9:29. 1890.

Hosts: Andropogon argenteus, Tex. (type); A. perforatus, Mex.; A. saccharoides, Tex., Mex.

This species is related through its very thick but much more regular epispore to Tolyposporella chrysopogonis though it does not form the definite spore-balls of that species. Its spores have considerable resemblance to Kuntzeomyces ustilaginoideus but the outer coat, upon pressure, does not break open and let out the unruptured spore as does that species but the fissure extends clear through the spore.

TOLYPOSPORELLA CHRYSOPOGONIS Atk.—Host: Chrysopogon nutans, Ala. (type), Tex.

TOLYPOSPORIUM BULLATUM Schröt.—Host: Panicum crus-galli, Conn., Ia., Ill., Mass.

TOLYPOSPORIUM ERIOCAULI Clint.—Host: Eriocaulon septangulare, Mass. (type), N. H.

TESTICULARIA CYPERI Klotz.—Hosts: Rhynchospora macrostachya, N. Y.; Cyperaceae, N. Amer. (type).

TILLETIACEÆ.

* Spores smooth. (Tilletia.)

TILLETIA FOETENS (B. & C.) Trel.—Host: Triticum vulgare, Ia., Ind., Ill., Kans., Ky., Md., Mass., Mich., Minn., Mont., Neb., N. Car. (type), N. Dak., N. J., Ohio, S. Dak., Wisc., Wyo., Manitoba, N. W. Ter.

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* Listed by Jennings as a new species but not described.

** Spores reticulate. (Tilletia.)

TILLETIA TRITICI (Bjerk.) Wint.—Host: Triticum vulgare, Ia., Kans., Mich., Minn., Nev., N. J., Ohio, W. Virg. on leaves (?).

TILLETIA ANTHOXANTHI Blytt.—Host: Anthoxanthum odoratum, Conn.

This species was first described in 1896 from Norway. It has not been reported very often. The writer found it the past summer at New Haven, Conn. Apparently this is the only time it has been collected in this country.

TILLETIA ELYMI Diet. & Holw.—Hosts: Elymus glaucus, Mont.; Elymus sp., Wash. (type).

TILLETIA CEREBRINA Ell. & Ev.—Host: Deschampsia caespitosa, Rocky Mts. (type).

TILLETIA MONTANA Ell. & Ev.—Hosts. Redfieldia flexuosa, Neb.; Sporobolus gracillimus, Rocky Mts. (type).

TILLETIA FUSCA Ell. & Ev. — Hosts: Festuca microstachya, Rocky Mts. (type), Wash.; F. tenella, Ida., Mont., Ore., Wyo.

TILLETIA ASPERIFOLIA Ell. & Ev. — Hosts: Sporobolus asperifolius Colo., Mont., N. Mex., Ore., Rocky Mts. (type), Wash., Wy.; ?S. simplex, Mont.

*** Spores verruculose. (Tilletia.)

TILLETIA MACLAGANI (Berk.) Clint. n. nom.—Ustilago maclagani Berk., Grev. 3:58-9. 1874. Ustilago rotundata Arth., Bull. Ia. Agr. Coll. 1884:173. 1884. Tilletia rotundata* Ell. & Ev., N. A. F. no 1894. 1887. Tilletia rotundata Mass., Kew Bull. 153:145. 1899.

Host: Panicum virgatum, Conn., Ia. (type U. rotundata). Kans., Neb., Montreal (type).

The writer is indebted to Massee for a specimen of Berkeley's type of Ustilago maclagani and this proves to be the same as Arthur's Ustilago rotundata. The smut is evidently a Tilletia though its germination has not been reported.

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* Ellis and Everhart called the fungus Ustilago rotundata Arth., but said it was evidently a Tilletia and therefore American botanists have since called the fungus Tilletia rotundata (Arth.) Ell. & Ev.

**** Spores with prominent tubercles, spines or scales. (Tilletia.)

TILLETIA EARLEI Griff.—Host: Agropyron occidentale, S. Dak. (type).

This species is peculiar in that the sorus occurs in the modified culm of his host.

TILLETIA TEXANA Long n. sp.—Sori in ovaries, ovoid or oblong, about 3-5 mm. in length, more or less hidden by enveloping glumes, forming a somewhat agglutinated light-reddish brown spore mass; sterile cells not very numerous, hyaline, with very thick often lamellate walls and central contents; spores very light-colored, orange yellow (appearing as if somewhat immature) chiefly subspherical or spherical, with prominent conical tubercles (blunt or sometimes quite pointed) which extend out 2-3 μ to the evident hyaline envelope, chiefly 19-25 μ in diameter.

Host: Hordeum pratense, Tex. (type).

In Europe Tilletia hordei occurs as a parasite on a species of Hordeum but that smut possesses reticulate spores and so is quite distinct from the species described here. This description is based on the single collection made by Long and as the spores have somewhat the appearance of being immature, it may be that the description will need some changing with further study of the fungus. It is closely related to Tilletia buchloeana but apparently differs in the slightly larger lighter colored spores with more prominent tubercles and in the character of the hyaline membrane. The spores have not been germinated.

TILLETIA BUCHLOEANA Kell. & Sw.—Host: Buchloë dactyloides, Kans. (type).

TILLETIA CATHESTECI (Henn.) Clint. n. nom.—Ustilago cathesteci Henn., Hedw. 36:212. 1897.

Host: Cathestecum procumbens, Mex. (type).

TILLETIA CORONA Scrib.—Hosts: Leersia lenticularis, Miss.; L. oryzoides, D.C. (type), Mo.; L. virginica, D.C. (type), Ill., Miss., Ohio.

TILLETIA PULCHERRIMA Ell. & Gall.—Tilletia pulcherrima Ell. & Gall., Bull. Torr. Bot. Club, 23:210. 1896.

This herbarium name was merely mentioned here by Earle. The writer believes the fungus to be a distinct species from Tilletia corona Scrib.

TILLETIA RUGISPORA Ell. & Gall.—Hosts: Paspalum plicatulum, Tex. (type); Paspalum sp., Mex.

TILLETIA HORRIDA Tak.—Host: Oryza sativa, S. Car.

NEOVOSSIA IOWENSIS Hume & Hods.— Host: Phragmites communis, Ia. (type), Conn.

TUBURCINIA CLINTONIAE Kom.— Urocystis colchici Amer. auct. p. p. Tuburcinia trientalis Amer. auct. pp. Tuburcinia clintoniae Kom. Jacq-Koö-Tranz. Fungi Rossiae 260. 1899.

Hosts: Polygonatum giganteum, Ia.; Smilacina stellata, Mont.; Smilacina, Wisc.; Streptopus roseus, Brit. Col.

TUBURCINIA TRIENTALIS B. & Br.—Host: Trientalis europaea, Alaska.

UROCYSTIS WALDSTEINIAE Pk.—Urocystis waldsteiniae Pk., Ann. Rep. N. Y. Stat. Mus. 46:32. 1893. Ustilago waldsteiniae Paz., Rab-Wint-Paz. Fungi Eur. 4011. 1895. Urocystis gei Ell. & Ev., Bull. Torr. Bot. Club 27:572. 1900.

Hosts: Geum ciliatum, Wash. (type Urocystis gei); Waldsteinia fragarioides, N. Y. (type), Wisc.

This is not a typical Urocystis since it lacks the sterile peripheral cells. Pazschke has placed it under Ustilago but it has characters not in entire agreement with that genus. It seems best to let it remain under Urocystis until more is known of its development; especially of the germination of the spores.

UROCYSTIS ANEMONES (Pers.) Wint.—Hosts: Actaea alba, W. Virg.; Anemone caroliniana, Kans., Tex.; A. nemorosa, Conn., Ia., Mass., Me., Mich., N. Y., Wisc.; A. patens var. nuttalliana, Colo.; A. pennsylvanica, N. Y., Wisc.; A. virginiana, Tex.; Anemonella thalictroides, N. Y.; Hepatica acutiloba, Ia., Ill., Ind., N. Y., Wisc.; H. triloba, Mo.; Ranunculus fascicularis, Ill.; Trollius sp., N. Y.

UROCYSTIS CARCINODES (B. & C.) Fisch. d. Waldh. —Host: Cimicifuga racemosa, N. Car., Ohio, Penn. (type), Tenn.

UROCYSTIS SOROSPORIOIDES Körn.— Hosts: Aconitum columbianum, Utah; Aquilegia coerulea, Utah; Delphinium sp., Calif.; Thalictrum alpinum, Greenl.; Thalictrum sp., Mass.

UROCYSTIS VIOLAE (Sow.) Fisch. d. Waldh. — Hosts: Viola odorata, Canada; Viola sp., Minn.?

UROCYSTIS CEPULAE Frost.—Hosts: Allium cepa, Conn. (type), Ind., Mass., N. J., N. Y., Ohio; A. nevadense, Nev.

UROCYSTIS OCCULTA (Wallr.) Rab.—Host: Secale cereale, Conn., Mass., Minn., Ohio, N. J., N. Y., R. I.

UROCYSTIS AGROPYRI (Preuss) Schröt. — Hosts: Agropyron divergens, Wash.; A. repens, Mass., Verm.; Bromus ciliatus, Ia.; Calamagrostis canadensis, Ore.; Elymus arenarius, Greenl.; E. canadensis, Ia., Ill., Mo., Neb., Wisc.; E. robustus, Ia.; E. virginicus, Ill.

UROCYSTIS JUNCI Lagerh. — Host: Juncus balticus, Nev.

UROCYSTIS GRANULOSA Clint. n. sp.—Sori in the spikelets, ovoid to oblong, about 5-10 mm. in length, chiefly confined to the inner parts but showing through the more or less infected glumes, forming a granular, black spore mass; spore-balls reddish to black brown, ovoid to spherical, not easily ruptured, chiefly 28-50 μ in length; sterile cells reddish yellow, ovoid to subspherical, completely covering the spores, often somewhat indefinite in appearance through the collapsing of outer wall, about 8-13 μ in length; spores dark reddish brown, ovoid to spherical or polyhedral through pressure, smooth, about 13-19 μ in length.

Host: Stipa comata, Ida. (type).

This species is based on a specimen in S. M. Tracy's herbarium labeled Sorosporium granulosum Ell. & Tr. on Stipa comata, collected by Dr. F. V. Hayden in Idaho in 1859. It differs from the type of Sorosporium granulosum in the same herbarium on Stipa viridula in that the sori are in the spikelets, and the spore balls, have fewer spores and possess a definite covering of sterile cells.

UROCYSTIS HYPOXYIS Thaxt.—Host: Hypoxys erecta, Conn. (type), Mass.

*Spores dark colored. (Entyloma.)

ENTYLOMA LINEATA (Cke.) Davis.—Entyloma crastophilum. Amer. auct. p. p.

Host: Zizania aquatica, Conn., Ga. (type), Ill., Neb., S. Dak., Wisc.

ENTYLOMA CRASTOPHILUM Sacc.—Hosts: Holcus lanatus, N. Y.; Phleum pratense, Ia., Ill.

ENTYLOMA IRREGULARE Johans.—Host: Poa pratensis, Ill.

ENTYLOMA SPECIOSUM Schröt. & Henn.—Hosts: Alopecurus geniculatus, Tex.; Panicum proliferum, Ill.; Panicum sp., Ill.

ENTYLOMA CARICINUM Rostr.—Host: Carex rigida, Greenland (type).

** Spores light colored. (Entyloma.)

ENTYLOMA THALICTRI Schröt.—Entyloma ranunculi forma thalictri Farl., Bot. Gaz. 8:275. 1883.

Hosts: Anemone nemorosa, Wisc.; Thalictrum dioicum, Wisc. (type E. ranunculi forma thalictri Farl.); T. purpurascens, Ill.

This is probably the same as Schröter's E. thalictri though no specimen of the European fungus has been available for comparison.

ENTYLOMA MENISPERMI Farl. & Trel.—Host: Menispermum canadense, Ia., Ill., Kans., Minn., Mo., N. Dak., Wisc. (type).

ENTYLOMA COMPOSITARUM Farl. — Hosts: ?Ambrosia artemisiaefolia, Mass.; A. psilostachya, Kans., Wisc.; A. trifida, D.C., Ill., Mo., Wisc.; Ambrosia sp., Ohio; Aster cordifolius, Mass.; A. novi-belgii, Mass., Me.; A. paniculatus, Wisc.; A. puniceus, Mass., N. H. (type); Aster sp., N. Bruns.; Bidens chrysanthemoides, Kans.; Erigeron elatus, Wash.; E. philadelphicus, N. Dak.; ?Eupatorium ageratoides, Ill.; Gnaphalium sp., Ala.; Helenium autumnale, Wisc.; Heterotheca lamarkii, Kans.; Lactuca canadensis, Minn.; Lepachys pinnata, Ia., Ill., Minn., Wisc.; Rudbeckia laciniata, Mo., Ohio; Senecio aureus, Neb., Wisc.; S. aureus var. balsamitae, Kans.; Silphium integrifolium, Wisc.

The writer has not examined this species on all of the above hosts and in such cases has depended upon the reported identity of the species. It is possible that on some of these hosts the species may be E. polysporum. In some cases the same host may have either species attacking it, however.

ENTYLOMA POLYSPORUM (Pk.) Farl. — Entyloma holwayi Syd. Ust. 282. 1901.

Hosts: Ambrosia artemisiaefolia, Ia., Ill., Ind., Mich., N. Y., Wisc.; A. bidentata, Ill.; A. trifida, Ill., N. Y. (type): Cosmus sulphureus, Mex. (type E. holwayi); Gaillardia pulchella, Kans.; Helianthus annuus, Mont.

ENTYLOMA ARNICALIS Ell. & Ev.—Hosts: Arnica chamissonis, Wash. (type); A. cordifolia, Ida.; A. latifolia, Wash.

ENTYLOMA GUARANITICUM Speg.— Hosts: — ?Bidens frondosa, Mass.; B. leucantha, Fla.

ENTYLOMA FLOERKEAE Holw. — Host: Floerkea proserpinacoides, Ill., Ohio, Wisc.

ENTYLOMA COLLINSIAE Hark.—Host: Collinsia bartsiaefolia, Calif. (type).

ENTYLOMA LOBELIAE Farl.—Host: Lobelia inflata, Conn., Ill., Mass., Me., (type), Mo., N. Car., N. H., Ohio, Wisc., W. Va.

ENTYLOMA PHYSALIDIS (Kalchb. & Cke.) Wint. — Entyloma besseyi Farl., Bot. Gaz. 8:275. 1883.

Hosts: Physalis angulata, Miss.; P. lanceolata, Ill., Kans., Ohio, S. Dak.; P. lanceolata var. laevigata, Kans.; P. Philadelphica, Ind.; P. pubescens, Ill., Ind., Kans., Tex., Wisc.; P. virginiana, Ia., Ill., Mich., N. J., N. Y., Wisc., Can.; Physalis sp., Conn., Ia. (type E. besseyi Farl.), Kans., Ky., Neb., N. Y., Tex., Wisc.; Solanum nigrum, Ia., Kans.; S. triflorum, N. Dak.

ENTYLOMA SEROTINUM Schröt.—Host: Mertensia virginica, Ia., Mary.

ENTYLOMA SANICULAE Pk.—Hosts: Sanicula marylandica, Ia., Ill., N. Y. (type), Wisc.; S. menziesii, Calif.; Sanicula sp., Ala., Ind.

ENTYLOMA ERYNGII (Cda.) DeBy.—Host: Eryngium yuccaefolium, Ia.

ENTYLOMA LINARIAE Schröt.—Host: Linaria vulgaris, N. J.

ENTYLOMA LINARIAE var. VERONICAE Hals.—Hosts: Veronica americana, Colo., N. Y.; V. peregrina, Ia., Ill., Mary., Mo., Wisc.

ENTYLOMA ELLISII Hals. — Host: Spinacia oleracea, N. J. (type).

ENTYLOMA ESCHSCHOLTZIAE Hark.—Host: Eschscholtzia californica, Calif. (type).

ENTYLOMA FUSCUM Schröt.—Host: Papaver sp. cult., Me., N. Brunsw.

ENTYLOMA MICROSPORUM (Ung.) Schröt.—Hosts: Ranunculus fascicularis, Wisc.; R. septentrionalis, Ill., Wisc.; Ranunculus sp., Ia.

ENTYLOMA MICROSPORUM var. PYGMAEUM Allesch. — Host: Ranunculus pygmaeus, Greenl. (type).

The writer has not seen a specimen of this variety. Judging from the description it does not seem to differ very essentially from the species.

ENTYLOMA NYMPHAEAE (Cunn.) Setch.—Entyloma castaliae Holw., Trans. Wisc. Acad. Sci. Arts. Let. 11:174-6. 1897.

Hosts: Nuphar advena, Conn., Ill., Mass., Wisc.; Nymphaea odorata, Conn., Mass., Ohio; N. reniformis, Ia., Ill., Wisc.; Nymphaea sp., Ia., N. J., Ohio.

BURRILLIA DECIPIENS (Wint.) Clint. n. nom. — Doassansia decipiens Wint., Journ. Mycol. 1:102. 1885.

Host: Limnanthemum lacunosum, N. J. (type).

The spore-balls of this species have no definite cortical layer and for this reason it has been placed by the writer under Burrillia.

BURRILLIA ECHINODORI Clint. n. sp. — Doassansia alismatis of Hark. in Proc. Calif. Acad. Sci. II, 2:231. 1889.

Sori in the leaves, forming irregular to sub-circular areas, showing spore-balls as closely clustered very minute elevations on both surfaces of the leaf; usually a single spore-ball occupying entire section of leaf between layers of the epidermis, more or less merged sidewise, often irregular but chiefly oblong to subspherical, without distinct cortex but composed of sterile cells and spores intermixed; sterile cells light reddish brown, with thinner walls than the spores and more irregular in shape and size; spores light-colored, chiefly ovoid to spherical, occasionally somewhat flattened, apparently thick-walled, 12-18 μ in length.

Host: Echinodorus rostratus, Calif., Fla. (type).

This species was, apparently, first reported from California by Harkness, who called it Doassansia alismatis. Setchell evidently made an examination of this material as he states that it is not this species but an Entyloma with a compact sorus. The writer's description is based on a specimen in the herbarium of the U. S. Dept. Agr., Div. Veg. Path. and Phys., collected by Simson in Florida in 1892. Sections from this material show that the sori have no definite cortex and that the spores are larger and thicker walled than either Doassansia alismatis or D. sagittariae to which the species has superficial resemblance. The sori are also much larger; these larger sori in some cases, however, appear to be due to a very complete fusion of smaller sori. The peculiarity of the species is that the sori are not composed entirely of spores but of sterile cells and spores intermixed. The sterile cells are not strikingly different from the spores but have more the appearance of the ordinary cortical cells. Upon staining with eosin the spores become more evident through their thicker more regular walls.

BURRILLIA PUSTULATA Setch.—Doassansiopsis pustulata Diet., Nat. Pflanzenf. 1^{1**}:22. 1897.

Host: Sagittaria variabilis, Ill. (type), Wisc.

* Eudoassansia.

DOASSANSIA EPILOBII Farl.—Host: Epilobium alpinum, N. H. (type).

DOASSANSIA RANUNCULINA Davis.—Host: Ranunculus multifidus, Wisc. (type).

DOASSANSIA SAGITTARIAE (West.) Fisch.—Hosts. Sagittaria arifolia, Ill.; S. graminea, Ill.; S. heterophylla, Wisc.; S. variabilis, Kans., Mo., Ohio, N. Y., Wisc.; Sagittaria sp., Mo., Verm., Can.

DOASSANSIA ALISMATIS (Nees.) Cornu.—Host: Alisma plantago, Calif.?, Ia., Kans., Minn., Mo., Neb., Wisc. Alisma plantago, Calif.?, Ia., Kans., Minn., Mo., Neb., N. Y. Wisc.

DOASSANSIA OPACA Setch. — Host: Sagittaria variabilis, Conn., Ill., Mass. (type), R. I.

** Pseudoassansia.

DOASSANSIA OBSCURA Setch.—Host: Sagittaria variabilis, Conn. (type), Mass. (type), Wisc.

*** Doassansiopsis.

DOASSANSIA OCCULTA (Hoffm.) Cornu.—Doassansiopsis occulta Diet., Nat. Pflanzenf. 1^{1**}:21. 1897.

Hosts: Potamogeton pennsylvanicus, Conn., N. Y.; Potamogeton sps., Ill.?, Kans.

DOASSANSIA OCCULTA var. FARLOWII (Cornu.) Setch.—Hosts: Potamogeton natans, Can.; P. pennsylvanicus, Verm.; P. perifoliatus var. lanceolatus, Can.; P. pusillus, Can.; P. vaseyi, Can. (type).

There is some question whether the variety is distinct. It has been studied especially only on Potamogeton vaseyi.

DOASSANSIA MARTIANOFFIANA (Thüm.) Schröt.—Doassansiopsis martianoffiana Diet., Nat. Pflanzenf. 1^{1**}:21. 1897.

Hosts: Potamogeton natans, Mass.; Potamogeton sps., Conn., Ill., N. Y., Wisc., Can.

DOASSANSIA DEFORMANS Setch.—Doassansiopsis deformans Diet., Nat. Pflanzenf. 1^{1**}:21. 1897.

Hosts: Sagittaria variabilis, Conn. (type), Ill., Mass., Mo., R. I., S. Dak., Wisc., Can.; S. variabilis var. angustifolia, Ill.; Sagittaria sps., Fla., Tex.

DOASSANSIA INTERMEDIA Setch.—Doassansia intermedia Setch., Bot. Gaz. 19:185-6. 1894. Doassansia affinis Ell. & Dearn., Bull. Torr. Bot. Club 22:364. 1895.

Host: Sagittaria variabilis, Minn., N. H. (type), Can. (type D. affinis).

TRACYA LEMNAE (Setch.) Syd.—Cornuella lemnae Setch., Proc. Amer. Acad. Arts. Sci. 26:19. 1891. Tracya lemnae Syd., Hedw. Beibl. 40:2. 1901.

Host: Spirodela polyrrhiza, Conn., Mass. (type), R. I., Wisc.

Conn. Agr. Exp. Station, September, 1902.

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